

ABSTRACT OF THE DISCLOSURE

There is disclosed a method of manufacturing a semiconductor device, wherein an  $\text{Si}_3\text{N}_4$  film is formed as a mask member on the surface of a silicon substrate, then etched to form an STI trench. A solution of perhydrogenated silazane polymer is coated on the surface of the silicon substrate having an STI trench formed thereon to deposit a coated film (PSZ film) thereon. The PSZ film deposited on the mask member is removed, leaving part of the PSZ film inside the trench, wherein the thickness of the PSZ film is controlled to make the height thereof from the bottom of the STI trench become 600 nm or less. Thereafter, the PSZ film is heat-treated in a water vapor-containing atmosphere to convert the PSZ film into a silicon oxide film through a chemical reaction of the PSZ film. Subsequently, the silicon oxide film is heat-treated to densify the silicon oxide film.